DOCUMENT RESUME

ED 294 189 CS 211 173

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TITLE Interdisciplinary Learning: A Resource Guide. A Small Place to Begin.
INSTITUTION Colorado State Dept. of Education, Denver.
PUB DATE 87
NOTE 84p.
PUB TYPE Guides - Non-Classroom Use (055) -- Reference Materials - Bibliographies (131)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS Annotated Bibliographies; Cognitive Processes; Critical Thinking; Curriculum Development; Educational Change; Educational Objectives; Elementary Secondary Education; Individualized Instruction; Integrated Curriculum; *Interdisciplinary Approach; Learning Processes; Teaching Methods
IDENTIFIERS Colorado State Department of Education; ERIC; *Multidisciplinary Education

ABSTRACT

This guide provides resources for teachers who want to develop and provide interdisciplinary instruction for their students. Following an introduction, the first section, "Subject Area Philosophy and Rationale," covers subjects from English and humanities to environmental education and physical education, discussing how to teach process skills rather than isolated facts and skills and how to make connections across the curriculum. The second section, "Projects in Action," describes a dozen interdisciplinary projects which are being carried out in Colorado. The third section, "Idea Bank," includes the following subsections: (1) Suggestions and Recommendations; (2) Guide for Evaluating Materials; (3) ERIC Search (an annotated bibliography of articles on interdisciplinary education that have appeared in ERIC); (4) Additional Readings and Materials; (5) Helping Students Write Answers to Essay Questions; (6) Games and Activities That Enhance Academic Skills; (7) A Process to Personalize Learning (presents a rationale for personalized learning and a systematic approach to transforming the structure of school) and (8) The Essentials of Education: A Call for Dialogue and Action. (ARH)

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INTERDISCIPLINARY LEARNING: A Resource Guide

"A Small Place to Begin"

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1987

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INTERDISCIPLINARY LEARNING:
A Resource Guide

A SMALL PLACE TO BEGIN

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May 1987
Revised August 1987

CSa1173

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Interdisciplinary Learning:
A Resource Guide

A Small Place to Begin

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INTRODUCTION

The subject area consultants at the Colorado Department of Education have had the opportunity to develop an understanding of the underlying connections among their various areas of expertise. This document has been developed in response to their wish to provide resources for those teachers equally convinced of the need to develop and provide interconnected experiences for their students.

This resource guide is only "a small place to begin."

> *...we need a small place to begin.*
> *...an experimental attitude is critically important. In a certain sense what we desire to do we do not yet know how to do . . . it will require a willingness to take risks, we will make mistakes, it will require evaluation and revision at every step of the way.*
>
> Eliot Eisner (1982)
> Cognition and Curriculum:
> A Basis for Deciding What to Teach

A new kind of knowledge is needed to unravel the nature of the cohesive forces that maintain man in an integrated state, physically, psychologically, and socially, and enable him to relate successfully to his surroundings.

Rene Dubos
So Human an Animal

A BRIEF HISTORY OF INTERDISCIPLINARY EDUCATION

A Brief History of Interdisciplinary Education

Rene Descartes demonstrated his awareness of the interrelationships of various branches of knowledge when he wrote, "...all things to the knowledge of which people are competent are mutually connected in some way."

The concept of interdisciplinary education is not a new idea. In 1937, L. Thomas Hopkins collected definitive information on integrated education. He considered integration from all aspects: philosophical, biological and psychological, with examples of correlated curriculum, broad fields curriculum, core curriculum and the experience curriculum. Since that time there have been several formal efforts to develop an integrated curriculum.

The concept of all efforts has basically been the same. The difference seems to come in the organization, the scope or the purpose. Interdisciplinary education has appeared historically under many names: team teaching, correlation, core curriculum, fusion.

Strategies have varied from <u>complicated complex structures</u> generally contained within gifted and talented classrooms to <u>special programs</u> available to one specific group of children at a grade level

> *(i.e., the correlation or fusion of American history and American literature. The boundaries of the discipline remain intact, but efforts are made to correlate events, writings, and ideas that occurred in the same time frame)*

to <u>information coordination</u> among teachers in one or more subject areas where relationships are made part of the instruction

(i.e., assigning a research paper in social studies which is graded in social studies for content, produced in business classes for a typing grade and evaluated in English for technical accuracy.)

Coordinating the many facets of education into a meaningful whole, then, is obviously not a new idea. Efforts at providing a formal education that makes connections among ideas, content subject matter, life experiences, areas of teacher expertise, and student interest have surfaced through the history of the profession.

However, as much as professional educators profess the benefits of such integration, as much as parents and employers long to see the student enthusiastically and correctly applying the knowledge gained so laboriously in the nation's classrooms, as much as students yearn to see a connection between the "book learning" and the "real world," no truly viable, comprehensive, or durable strategies that stand the test of time for making these connections for all students within the confines of the school setting have been developed.

THE NEED FOR CONTINUED RESEARCH AND EMPHASIS

The Need for Continued Research and Emphasis

What is different about what is happening now? Are we dealing with another "disposable" program--one that occupies a good deal of time and thought only to lose favor as the educational tide washes in and out? (As Lily Tomlin has remarked, "I am sick of being the victim of trends I reflect and don't even understand.")

The need for comprehensive integration or interconnection is becoming more and more obvious as we enter full swing into the information age. The realization that 75% of the information available to us today didn't exist 20 years ago has turned our attention from acquiring specific facts--which sometimes change daily--to acquiring the skills necessary to gather, process and retrieve information.

As we consider the fact that in the year 1985, a 35% growth in information occurred and it is predicted that by the year 1990 knowledge will increase 100% a year, it is becomes clear that the acquisition of facts will no longer provide a solid basis for education necessary for those living in the year 2000.

In Schools of the Future, Marvin Cetron states that "...our traditional secondary school courses will become interdisciplinary. History and art will mix with political science and math with science. English will be used to organize our thoughts in all areas."

Through his study for the National Association of Secondary School Principals, a chart has been developed that contrasts directions for education in both an industrial society and an information society.

Directions for Education

Goals of Education	*In an Industrial Society*	*In an Information Society*
Cognitive Goals	Basic Skills Specific training Unicultural Literacy	Higher-order skills and basic skills Generalizable skills Global education Many literacies, more than one language
Affective Goals	Large organization skills Organization dependent	Small-group skills Independent, entrepreneurial
Curriculum	Learning simple discipline skills Standardized programs Computer as vocational skill	Interdisciplinary programs Varied program options Computer as learning tool in all programs
Job Preparation	Single career prep Late skill development Distinct vocational education programs	Multiple career prep Early skill development Career/vocational education as integral part of educational experience
Delivery Systems		
Changing Institutional Patterns	Single district system focus Central office management Top-down, insulated decision making Group instruction	More variety at level of individual school School-based management Bottom-up, participative decision making Individualized instruction using technology

Cetron, Marvin
Schools of the Future

The challenges offered to educators by the many reform reports have focused attention on discovering new and better ways of teaching students and monitoring progress. Most reports have clearly defined areas of weakness in our educational system, but they are somewhat vague and contradictory about what can be done.

> *Clearly, something is missing in the way we are educating our children....What is that missing something? Most fundamentally, perhaps, it is a sense of cognitive unity, a unity which imparts meaning to the world and from which our values unfold. We cannot go backward to look for this unity; but perhaps it lies before us if only we can cleanse the gates of our perception.*
>
> *The one great obstacle to our perception is the academic curriculum the way it is currently shaped. The last 400 years of scientific and intellectual progress contain a gigantic paradox.* ***Every profound insight in the sciences and other intellectual disciplines, has torn down the barriers and distinctions between those disciplines; and yet the institutional result of these achievements has been the further fragmentation and specialization of the academy.***
>
> Frederick Turner

At the same time a need for a change is being identified, a major new study conducted by the Carnegie Foundation for the Advancement of Teaching singles out several "deep divisions in the typical undergraduate experience. Among them: a disjointed curriculum whose "disciplines have fragmented into smaller and smaller pieces, unrelated to an educational whole."

Research on the development and specialization of the brain has opened new doors to understanding how we learn. We know now that learning is a wholistic experience; seeing connections and patterns is a vital part of that experience. It

is through these connections that the transfer of skills necessary to make knowledge useful occurs. Without the ability to make connections and see patterns, children can add and subtract and can't make change; can name the capitol cities of all the states and have no idea which states border Colorado; can name and identify the parts of speech and rules of punctuation and capitalization and yet can't write something worth reading.

Howard Gardner suggests that there are seven basic kinds of intelligence, and that most children--especially if encouraged--develop strengths in at least one. In education, we have primarily focused on two of these intelligences, linguistic and the logical-mathematical. The other five, musical, spatial, bodily-kinesthetic and intra and inter-personal, deserve more attention. Gardner's research makes a strong case for developing curricula focusing on a variety of learning styles and strengths of students.

Changes in society have produced kids different from those of 20 years ago. These changes include the influence of television (a visual rather than a print medium), the diminishing numbers of people who read books for pleasure and, therefore, have less rich experiences on which to draw, the lack of family support and structure, the search for instant gratification rather than long term investments, the lack of concern on the part of society for children and their needs. We can no longer be assured that the education we received is still adequate or meaningful for our children.

THE CONCEPTS OF CONTENT AND PROCESS

The concepts of content and process have evolved from new understandings of brain function during the learning experience.

Content is identified as the knowledge or information gained by the student; for example, addition and subtraction and multiplication tables.

Process is identified as the ability of the student to make connections or to see patterns so that the transfer of information from one situation to another occurs; for example, using knowledge of addition and subtraction to make change.

Both content and process are necessary components of the learning experience. It is important for teachers to understand the balance between them and the appropriate point at which each should be introduced and practiced.

The relationship between content and process in a learning experience might be more easily understood through the following analogy: When learning to drive a car, a process must be internalized before a great deal of content specific information can be learned. The beginning lessons focus attention on remembering to turn the key, step on the clutch, engage the gear, release the clutch slowly, depress the gas pedal, etc. Providing rules of the road (the car to the right in the intersection has the right-of-way, parallel park approximately 12 inches from the curb) when the process occupies most of the brain's thinking space is an exercise in futility. As soon as the process has become automatic and does not take up conscious thinking space, content can be learned because it has a context (the driving process) to which it can be connected.

Another example involves the way children learn to write. When the physical process of forming letters and words demands full attention, providing spelling rules or

punctuation and captalization information is not only nonproductive but can cause tremendous amounts of frustration. At the time thought and oral language are being translated into the written word, an emphasis on matters of correctness and structure only inhibits the process and confounds the ability of the student to learn.

In other words, it is important for the student to have the "whole" of the experience, the underlying understanding of what is to be accomplished--the process--before specific content has meaning and relevance.

This is not to say that content knowledge or error correction are not important parts of the learning process. These examples point out how much teachers need to become aware of the appropriateness and timing of experiences.

Educators have long been skilled in assessing the information learned by students. Extensive batteries of standardized tests gauge regularly how well and how much information has been accumulated during a period of time; but our reliance on standardized test scores to assess the effectiveness of educational programs has provided a very narrow range of evaluation.

If we believe that the acquisition of content knowledge and process skills are equally important educational goals, it becomes important to evaluate not only the information the student has gained, but also the student's ability to processs that knowledge. To this end, research is being carried on in an attempt to find new means of evaluating a student's total educational experience. Non-traditional means of evaluation must be considered if accurate information on the state of a child's educational progress is to be available.

A Definition of Terms

An interdisciplinary approach to learning combines or interrelates aspects of at least two academic disciplines or subject areas, utilizing the content, the principles, or the procedures of the disciplines.

Designing Interdisciplinary Studies Programs: A Project Development, University of the State of New York

Twenty-two national professional organizations have endorsed a statement defining what is termed "the Essentials approach:"

What, then, is the Essentials approach? It encompasses the content and skills (including psychomotor) required to learn and use effectively all disciplines, as well as the development of attitudes and behaviors, in groups and between individuals, which are practiced inside and outside of school. In short, the approach seeks to educate the whole child.

...it recognizes that certain skills are so important that the best way to develop them is to practice the skills in a variety of different learning situations and to develop a curriculum which utilizes these skills in as many disciplines as possible....[it] allows the student to develop skills and processes through content and encourages teachers to use interdisciplinary activities to blend the content of two or more areas. The approach, however, goes beyond the practice of interdisciplinary education to support developing an interdependent curriculum.

The Essentials of Education Statement

"Interdisciplinary," "cross-disciplinary," "integrated," "multi-disciplinary," "essentials" are used almost interchangeably when discussing attempts to provide connections among areas of learning. The following levels seem to be implied by the historical perspective of the terminology and by current use.

INTERDISCIPLINARY PROGRAMS	
Concept	**Structure**
Teacher initiates relationship between parts or subject areas, but not to the whole; superficial connections are made. "Turn teaching" methodology; teachers remain content area specialists. Source of information is the teacher; subject matter limited to teacher knowledge. Right answers given and received according to teacher understanding of connections. Norm referenced evaluation of content. Curriculum is written with specific, isolated content area objectives.	Traditional time periods. Generally includes two subject areas. Double periods are scheduled for classes Coordinated planning time for all teachers involved. Teacher focused classroom.

CORE CURRICULUM	
Concept	**Structure**
Emphasis on academic areas. Generally includes three or four basic areas. Integration of content in more areas. Teacher initiated relationships between subject areas without recognition of the whole of the educational experience. Teachers are content specialists; each provides a spearate piece of the puzzle. Norm referenced evaluation of content.	Bigger time blocks. Planning periods coordinated for teachers involved. Teacher focused. Curriculum is written in content specific objectives.

ACTIVITY BASED PROGRAMS	
Content	**Structure**
Focus is on what the student does rather than what the teacher teaches. Skills and processes are considered along with subject matter content, but the whole is not complete. Includes areas other than academic areas. Emphasis is on problem solving skills rather than rote acquisition of knowledge. Teacher becomes facilitator of learning rather than a source of information. Informal evaluation structure.	Student focused. Restructuring of school day according to needs of activity and students.

INTEGRATED CURRICULUM	
Concept	**Structure**
Processes are seen as underlying foundations for the acquisition of knowledge. Teacher is facilitator. Students make connections. Right questions indicate depth of knowledge rather than right answers. Emphasis is on student use and application of knowledge. Learning involves the whole child with attention to learning styles and teaching styles.	Student focused. Curriculum is written as a unified whole. Restructuring of school day by needs of students and learning.
Criteria references and norm referenced evaluation with **strong accountability component.**	

An appropriate analogy might be to compare the increasing complexity of the move from interdisciplinary to integrated education to a ball of string. The interdisciplinary connections are exemplified by small pieces of string that are tied together. As you pull on one piece of string, another comes along eventually that is connected to it. An integrated setting is more like a tangled ball of string. Pulling on one piece of string results in a tangle of strings being exposed--it being difficult to follow one string from beginning to end as all other strings are intricately intertwined with it. It becomes impossible to deal with isolated pieces of string from any period of time.

Because the interconnections become so intricate and involved, it is impossible to deal with them within strictly enforced time periods. Ted Sizer alluded to this issue in describing his coalition to rethink the structure of schoools: "Unfortunately...the basic design of high schools--including age grading, 55 minute class periods and an emphasis on plowing through content--too often gets in the way of student learning." ("Education Week," February 18, 1987.)

One of the major shifts that occurs when moving from the traditional classroom to an integrated approach is the shift from a teacher focused classroom to a student focused classroom--a shift in focus from what is taught to what is learned.

TEACHER FOCUSED CLASSROOM	STUDENT FOCUSED CLASSROOM
Linear structure programmed sequenced defined and confined	Non-linear structure
Convergent	Divergent
Reductionist	Expansionist
Right Answer	Right Question problem solving process orientation
Separate programs/students/ skills	Connections/whole of the experience
Student is passive learner	Student is active learner

TEACHER FOCUSED CLASSROOM	STUDENT FOCUSED CLASSROOM
Teacher role information provider learning director determines priorities provides materials determines scope and sequence of learning responsible for student learning	Teacher role facilitator of learning learning guide offers choices helps find materials helps students determine scope and sequence shares responsibility for learning with student

Change is never easy, but ...

Those who would be leaders in education
Must become leaders in learning.
We can rationalize the failures of the past--
Or we can learn from them.
We can complain about the troubling inadequacies
Of the present
Or we can face them.
We can talk and dream about the glorious schools
Of the future--
Or we can create them.
If we want children to learn to think and read,
We must show them thoughtful people
Eager to take in new information.
If we want them to be brave and resourceful,
Let them see us risking a new idea or finding a way.
If we want them to be loyal, patriotic and responsible,
Let us show them that we can be true
To our deepest principles.
If we want new and better schools,
We will have to be new and better people...
AND WASN'T THAT WHAT WE ALWAYS WANTED?

Towards the Quantum Mind

All we really need is one small place to begin.

SUBJECT AREA PHILOSOPHY AND RATIONALE

Knowledge is changing and expanding overnight in many of the disciplines. Television, radio, telephone, satellites, computers, CD-ROM and laser discs all contribute to the expanding information networks. Tony Buzan, author of Use Both Sides of Your Brain, estimates that only 1% of what there is to know is presently known. Information provided in many courses today may be irrelevant to many learner's lives five years later or may be proven to be incorrect. It is increasingly more difficult to select which facts to teach, particularly since the knowledge base is growing and facts are so perishable.

Adding courses, requiring more credits, extending the school and homework assignments or giving more competency tests will not keep pace with the information explosion nor the new skills required for survival in the Information Age. In Schools of Future, Marvin Cetron suggests that the information "crunch" created by technologies means moving from discipline specific skills and standardized programs to interdisciplinary and varied program options.

Students need an environment in which to learn more efficiently how to learn, how to make sense of the rapidly expanding body of new knowledge, and how to think and learn in each discipline. In nearly every subject area, process skills rather than isolated facts and skills are needed as a framework for curriculum. Teaching students how to identify, select, analyze, and communicate information across the curriculum will have useful and lasting effects in preparing students to live and work in the 21st Century. Moving from the Industrial Age to the Information Age means re-examining instructional goals, curriculum and instructional strategies.

Conservation/Environmental Education

The web of inextricable relationships that binds all things together--frequently in ways only dimly understood and not comprehended at all--finds a sense of order in conservation and natural resource studies. Reality, in conservation terms, is made up of organic or unified wholes that are greater than the simple sum of the parts.

As Sand County Almanac's author, Aldo Leopold, has so vividly stated: "Harmony with land is like harmony with a friend; you

cannot cherish his right hand and chop off his left.... The land is one organism."

Before Pliny and since Thoreau, nature has found universal expression in the literature of all languages--in French Jean Jacques Rousseau, in German Goethe and Schweitzer, and in Colorado Enos Mills' Wildlife in the Rockies influenced the establishment of Rocky Mountain National Park. Artists, musicians, architects, and builders have drawn upon the natural world to impart a message. Beethoven's *Pastoral*, Bierstadt's *Estes Park 1877*, and Audubon's birds reflect the beauty and harmony of nature--a sense of calm, a holism, a purpose. The whole earth--the soils, the rocks, as well as forests and wildlife--are encompassed and longed for, to paraphrase Beethoven.

Aldo Leopold summed it up: "Our ability to perceive quality in nature begins, as in art, with the pretty. It expands through successive stages of the beautiful to values as yet uncaptured by language."

Since every person imprints upon the environment, each person/activity/subject addresses conservation--destructively, ignorantly, or wisely. Conservation education, known too as environmental education or natural resources, addresses humankind's responsibility for the well-being of all living things.

Since man-made objects and the use of inorganic materials so directly impact all life forms, everything associated with ecology and environment lends itself to consideration of environmental quality. Applied to curriculum, that translates into inclusion of conservation content and skills within every subject area. Therefore, it follows that natural resource content, concepts, and skills are legitimate, if not necessary, is all subject fields.

For example, mathematics can measure the quantity and can quantify environmental quality. Lifetime sports are an exhilarating physical and mental "re-creation" in the out-of-doors. Health education (a health lifestyle) portrays the responsibility that promotes a sense of calm, holism, and purpose.

The quality of civilization depends upon the caliber of the individuals produced. How the individual behaves speaks to the level of our civilization: whether considerate and compassionate; whether celebrating the dignity, uniqueness and rights of others, including flora and fauna; whether a caretaker or taker. Providing through interdisciplinary learning the opportunity and direction for the individual to develop positive character attributes perhaps is

summum bonum for after all, what man's mind conceives man's character must control. Exercising responsibility to achieve this extends far beyond oneself and man-made institutions. "Like winds and sunsets, wild things were taken for granted until progress began to do away with them. Now we face the question whether a still higher 'standard of living' is worth its cost in things natural, wild, and free." Aldo Leopold.

Scientific and technological decisions about natural resources are made on the basis of economics, politics, and social issues -- all based upon value systems.

The justification is grim: "One million species---out of a total of five million---are at risk of extinction by the end of this century," according to Edward C. Wolfe in On the Brink of Extinction: Conserving the Diversity of Life.

Fine Arts

The arts are well suited to connections (integrating the arts themselves or integrating the arts with other subjects) and the efforts of school administrators who provide planning time for their teachers in these endeavors are often well rewarded.

It must be noted, however, that making these authentic connections is quite different from using the arts in teaching other subjects. For example, the history teacher who spends a couple of days teaching the art of Greece in a month-long unit about the ancient world is using the arts to teach an aspect of history. The teacher's purpose is not to provide students with learning experiences in the arts. In this limited approach, the teacher offers no studio training, does not develop students' analytical abilities with respect to examining works of art, and perhaps more importantly, does not have the time to provide the kind of aesthetic perspective and overview that makes studying the arts different from studying any other subject.

The second point that needs to be made from an arts educators' perspective is that the arts have always teetered precariously on the edge of the curriculum. Arts education has always struggled for survival. Many arts educators feel that if they support an interdisciplinary curriculum approach, the arts could lose their identity as an academic discipline, become "watered down," and educators would generally find themselves in an even more precarious position.

So, on the one hand, many arts educators support the concept of interdisciplinary education, but they are fearful it could have a negative impact without the direct involvement of certified arts teachers in developing and implementing the curriculum.

Arts education has always concentrated more on process rather than on content. Playing a musical instrument, for example, requires a combination of high level processes involving cognitive and psychomotor learning. Analysis, problem solving, evaluation and decision making are all necessary in order to read and perform a musical selection. The same is true in visual art, theater and dance.

Discipline-based art education is a current trend in visual art. The Getty Center for Education in the Arts, an operating entity of the J. Paul Getty Trust, was created to contribute to improving the quality and status of arts education in America's schools. The Getty Center conducted a study of public school art education programs and found that most instruction focused on hands-on art making activities. They also found that children were not receiving sufficient instruction in the cultural and historical contributions of art or in how to analyze, interpret and value works of art. As a result of the study, the Getty Center proposed a discipline-based art education model which includes art production, art criticism and the history of art and aesthetics. This model not only introduces a greater level of academic rigor into art education, but also focuses on higher level cognitive processes such as analysis and evaluation.

Ernest Boyer, president of the Carnegie Foundation for the Advancement of Teaching, believes symbol system mastery should be a top priority in education and he includes the arts as part of the mastery of our symbol system.

English

English teachers have long been aware that writing about <u>something</u>, reading about <u>something</u>, and thinking about <u>something</u> makes much more sense than teaching writing or reading or thinking in isolated, sub-skill oriented programs. Reading across the content areas, cross content area writing programs, write to learn programs, and thinking skill instruction integrated with concept and content instruction are examples of efforts to provide more effective instruction in these most essential of all processes.

Of the six areas into which the Colorado English Task Force divided English instruction: writing, reading, reasoning, speaking and listening, media and literature, only literature was identified as the sole responsibility of the English teacher. All other disciplines must

provide experiences for students in these other areas for effective learning to take place. We must combat the idea that correct spelling is only important in English class or that math class is the only appropriate place for grades to be calculated. As more is understood about the place of writing in all learning experiences, more resources are offered for content area teachers who once were fearful of including reading, writing or thinking skills as part of their curricular responsibilities.

This does not mean that all teachers must become teachers of writing and reading and thinking, but it does mean that students must be given opportunities to practice these skills in meaningful ways in other than the English classroom. Research shows clearly that coordinated and concentrated efforts to improve these skills on a school-wide basis are dramatically effective.

English teachers are basically teachers of process: reading is a process, writing is a process, thinking is a process. Only literature could be defined as a "content area." As these processes underlie all learning, the student's ability to produce them is highly coorelated with achievement in all classes. The problem of evaluation is difficult because there are no universally well accepted measurement devices for process activities available.

The move toward measuring student writing achievement through writing assessment is an effort to more accurately diagnose the student's ability to write. School-wide involvement in writing assessment efforts should be actively encouraged.

Foreign Language

It will be necessary for us to produce people proficient in more than one language in the future. We need to produce doctors who can read the research in two or three other languages, engineers who can work in other countries without an interpreter, sales personnel who know that the most important language is the one their customer speaks and who speak that language, diplomats who know what is going on in both sides of the conversation. It is obvious that the foreign language curriculum cannot stand alone.

Foreign language classes have long been mini-interdisciplinary classes: in a typical unit on a francophone country, the French teacher will present information on its history, geographical position, climate, food and literature. Students will make maps, charts, posters, read and write stories and compositions, do demonstrations, sing songs, perform theater and dance to learn about the country.

These efforts to recognize the oneness of language and culture by the foreign language teacher are to be applauded, but they allow students to learn another language and another culture and still feel isolated. We need to invite other Americans, teachers of other disciplines into our world, to show our students that other subjects are related to and can be understood through foreign language.

Researchers in the field of foreign languages suggest that we don't acquire a language by learning about it, we acquire it by listening to it, reading it and using it--in other words, approaching it as a process to be internalized rather than content knowledge to be memorized.

The American Council on the Teaching of Foreign Languages has identified a "new world of foreign language study." Vocabulary and knowledge of grammar are the tools which facilitate communication. No longer are students expected to acquire permanently and totally the entire grammar of a new language in their basic courses and to apply it without errors. Students are expected to progress through stages of acquisition, and they make errors on the way. As students experience different ways of interacting in the foreign language classroom, they are exposed to another culture with new customs, traditions, and art forms.

Humanities

Humanities is the integrated approach to the study of humankind. It includes the nature, heritage and aesthetics of any cultural group. When studying a culture, whether past or present, a humanities course includes the interrelationships of human thought, creation and experience. This multi-disciplinary approach involves the history, language, philosophy, religion, literature, music, art, dance and drama of the times. We must study the humanities to better understand the past and present and to provide a positive plan for a more meaningful future.

The important thing to remember is that the humanities have as their central concern the meaning and purpose of life. They focus on ideas such as the value of life, the nature of justice and freedom, the relationship of the individual to society, and the moral choices and consequences of human behavior. Although the humanities offer no "answers," they provide a perspective for a better understanding of human experiences.

Mathematics

The trend in mathematics education is to teach problem solving at all levels. Basic skills in mathematics should encompass more than the ability to do rote computations efficiently. In the past, mastery of computational skills isolated from their application was emphasized. With the advent of affordable calculators and computers, students will now be able to solve a variety of problems and to concentrate on the process of problem solving.

In teaching problem solving strategies, students will learn to analyze and conceptualize problems, define the problem and the goal, discover patterns and similarities, seek out appropriate data, and most importantly, transfer the skills and strategies learned to new situations. These skills can then be applied to a variety of disciplines including the social sciences, business, engineering, science, and the arts. In addition to applying the mathematics learned, students will also be learning communication skills. Mathematically competent students will be able to read mathematics and to talk clearly about it.

Our goal as mathematics educators is to show students that all mathematics is created in the process of formulating and solving problems, not in the quest for a single, "right" answer.

Physical Education

The human being is a very complex organism that demands an integrated source of stimulation for the promotion of growth and development. It is well known that no experience happens in isolation. Each new experience builds upon previous situations and the learning process expands with every new exposure to an element of our environment. The more unified or complex the experience, the greater the potential for an expanded growth situation.

As the psychomotor, cognitive, and affective learning of students proceeds simultaneously, so must the various subjects in the school curriculum also flow into the formation of numerous concepts and content areas. Whenever the instruction in one subject duplicates, parallels, or relates to that in another subject, more effective learning tends to result from this mutual reinforcement.

Integrating subjects allows for more efficient use of school time. As knowledge increases and schools are assigned additional responsibilities, there is insufficient time in the traditional school day to adequately cover all subject areas. Integration offers one solution to this time problem.

Science

The aim of science education for the 1980's and 1990's is to develop scientific and technological literacy for all citizens. This aim emphasizes a general understanding of science and technology. Science education for the 80's and 90's should achieve five fundamental goals:

1. Develop scientific and technological process and inquiry skills.

2. Use the skills and knowledge of science and technology as they apply to personal and social decisions.

3. Enhance the development of attitudes, values, and appreciation of science and technology.

4. Provide scientific and technological knowledge.

5. Study the interactions among science-technology-society in the context of science-related societal issues.

The learning of science must be seen as an integrated series of life experiences.

Technology

Professional literature hails the potential of the computer and other information technologies for transforming teaching and learning. Computers, video discs and CD-ROM are technologies that extend an individual's capability to store, retrieve, and communicate mass quantities of information. Finding patterns, relationships, and trends in electronic data for solutions to problems will be more important than traditional research. These technologies have the potential to extend an individual's abilities for critical thinking and creative thinking.

But the promised revolution for learning with technology is not taking place.

And it won't take place IF the primary focus is to treat computers as a separate content subject in the curriculum. It means only one teacher has to know anything about computers and very little has to change in the school curriculum. Teaching word processing and electronic data storage in a "literacy" class as useful application tools for computers fragments the curriculum. Content

teachers are unlikely to integrate the new ideas. Unless it is linked to the context of other subject areas, students are less likely to make the connections. Computer instruction must be integrated into the curriculum.

And it won't take place IF "old" wine is put into "new bottles" leaving everyone with the "old" wine. Most available software is drill and practice often based directly on print materials. In general, teachers are naturally most comfortable with textbooks because that is how they were taught. Machine uses that closely mimic textbooks are comfortable for teachers. The image of schools being filling stations that pump knowledge into students' brains is an image consistent with factory-like schools turning out students as passively involved products. Trying to merge technology into existing "industrial age" curriculums, however, is not what the computer does best. Beverly Hunter writing in High Tech for Schools notes that many of the skills that computers teach best are not included in the curriculum.

And it won't take place IF computers and other learning technologies are used as novel enrichment experiences for the more ambitious or curious student who finishes his or her "real" work. Using the computers as acivity-corners-in-the-backs-of-rooms or as visits-to-the-lab-of-machines-once-a-week means that computers need only be visible to fulfill the public pressure to "do something." Technology that is there for its own sake rather than because it is useful as a planned instructional strategy in the learning environment will be of no use to education.

And it won't take place IF implementation plans do not include preparing teachers and administrators to use technologies as one instructional strategy choice in delivering information age curriculum rather than automating the existing one. The role of the teacher is changing from lecturer and information disseminator to facilitator of a muti-task classroom that addresses different learning styles. Technology extends the range of choice.

And it won't take place IF the learning technologies are seen as just another passing fad. Instructional television, overhead projectors and film projectors are tools used as optional materials and have never achieved their full potential as teaching devices. Teachers need a new vision of how technology is impacting learning styles and educational needs. Learning technologies can support the process of moving from a teacher-focused classroom to a student-focused classroom.

There is exciting potential for technologies in the educational process. However, the impact and effectiveness of machines will be closely tied to educators' understanding of what changes are needed in curriculum, staff development, school strucure and existing conceptualization of learning. Moving schools into the information age requires much more than moving equipment into buildings. Integrating the use of television, calculators, computers, teleommunication devices, and laser discs effectively means examining models like "The Voyage of the MIMI." The elements of success in the MIMI model would be worth transferring into future curriculum units.

PROJECTS IN ACTION

The following information represents only a fraction of the interdisciplinary/integrated projects that are being carried out in classrooms all over Colorado. The Curriculum and Instruction project would like to gather an up-to-date listing of such projects. The projects included here are ones with which the consultants are familiar and with which they have worked in some capacity.

Applied Academic Program

The Applied Academic Program at Elizabeth High School offers students a unique learning environment which consists of two components.

The first component is a block of three courses: Applied Language Arts, Applied Math and Job Clusters. The Job Cluster course provides introductory work skills in four career areas: (1) communication, (2) manufacturing, (3) construction, and (4) transportation. The language arts and math curriculum is directly related and applied to the necessary language and math skills required in each cluster area. Thus, the academic courses are taught as integrated units based on the hands-on projects utilized in the job clusters section of the class.

The second component offers a COOP class which utilizes identified pre-employment and youth work maturity skills as a curriculum base for preparing young people for the world of work. In addition, a COOP work experience is offered to students who have the basic work maturity skills to be successful in a work environment. Some of these work experiences may consist of student entrepreneurial training resulting in concrete work opportunities.

The educational format is outcome based where specific academic and work related skills are mastered by each student outside of a tightly defined time line.

Art Enrichment in American History

"Art Enrichment in American History" is a unique program that was initiated in the fall of 1983 at Thornton High School, Thornton, Colorado. The program is an outgrowth of an inservice presentation by one of the arts teachers which led to extensive

dialogue between the Art and Social Studies Departments. During the exchange, it was determined that most students were lacking in knowledge of their American cultural heritage and that there was a need to remedy this void. Teachers from both departments were involved in the planning.

The enrichment program provides a multi-dimensional approach which utilizes all five teachers from the art department. Six different presentations are given throughout the school year. Each presentation is given for a six-week period in order to serve each of the thirty-five American History classes (including remedial and Advanced Placement) with one presentation each day. Each presentation is unique and might include: discussion, lecture, slides and activities. Students are exposed to many aspects of American culture.

Some of the topics covered have included: Photography, Design, Cartooning, Western Painting, Textile Arts and Folks Art, Architecture, Art in Politics, Calligraphy, Body Art, Women in Art and Native American Arts.

Buena Vista's E. Alfred Marquard Nature Area

The students at McGinnis Middle School in Buena Vista have developed a nature area which includes study zones and water conservation, forestry, wildlife and other natural habitats. The ongoing project headed by Colorado's 1987 Conservation Teacher of the Year, Chuck Clark, has resulted in the establishment of the E. Alfred Marquard Nature Area along the banks of Cottonwood Creek, adjacent to the school.

The six-acre outdoor classroom is shared with the Community of Buena Vista and is used by students and teachers of all grades. Students have built trails, put up signs, planted trees, and preserved a valuable wetland resource. Students have helped in the relocation of twenty bighorn sheep to Mount Blanc in the San Luis Valley as an example of close working relationships with federal and state agencies. In addition, a grant to improve the site for fishing and accessibility to the area for handicapped and disabled students has been made by the Colorado Division of Wildlife's PROJECT WILD Fund of Colorado.

The Constitution: Experiencing Democracy

This guide provides an interdisciplinary model for instruction of children K-6. This humanities based curriculum enables teachers to

make the events and people of early America "come alive" for their students. The primary focus is on the Constitution's basic values and principles so that children will develop an appreciation and dedication to a democratic way of life. The experiential approach provides students with a meaningful context in which to consider their rights and responsibilities as citizens in a free society.

Available from the Colorado Department of Education, Curriculum and Instruction Unit.

The Eagle Valley Integrated Curriculum Program

The National Council of Teachers of English identified the Eagle Valley Elementary School Integrated Curriculum Program as one of four Centers of Excellence in English Language Arts. Contact Karen Dalrymple or Joan Armon, Box 780, Eagle, CO 81631 for information.

The 18th Century Interdisciplinary Project

High Plains Elementary School in the Cherry Creek District developed an extensive school-wide interdisciplinary project in the spring of 1986. The project began as activities to be carried out during "enrichment periods," but became so popular, activities spilled over into classroom time. The 18th Century was chosen as the focus of this project because in numerous ways, the modern world can trace its origins to the events, discoveries, and ideas generated in this time period.

Two publications were produced for this project and are available from the school district: A Teacher's Manual includes introductions to the topics, activities for each topic and a glossary of 18th century characters, and an Interdisciplinary Project Catalogue to facilitate the use of materials available for the project.
Contact Person: Bev Trefny.

The Essentials of Education Integrated Units

An integrated curriculum model has been developed by the science and English consultants for CDE that has been used in a number of districts throughout the state. The model is based on the Essentials of Education position statement and provides a method of implementing the essentials statement into the classroom. The model provides a step by step sequence for developing an integrated curriculum unit, a format for mapping skills and processes that are

presented as well as subject area content, and an evaluation and an accountability system.

Units developed using this model:

Grade Level	Unit	Place
Kindergarten	Plants	Elizabeth Elementary School Woodland Park Elem School
1st	Dinosaurs	Elizabeth Elementary School
	Five Senses	Elizabeth Elementary School
	Space	Elizabeth Elementary School
2nd	Colorado History	Georgetown Elementary
3rd	Constellations	Co Springs (Henry Elementary)
	Biospheres	Co Springs (Henry Elementary)
	Rocks, Minerals, Machines	Co Springs (Henry Elementary)
	Animals	St. Vrain Valley Schools
4th	CO History	Co Springs (Henry Elementary)
	The Future	Co Springs (In progress)
5th	Civil War	Co Springs (Henry Elementary) Yuma (West Middle School)
6th	EcoWeek	St. Vrain Valley Schools
	Middle Ages	Co Springs (Henry Elementary)
	Space	Co Springs (Henry Elementary)
K-6	Time	Canon City
K through 7	Space	Elizabeth Elementary
7-12	Revolutionary War	Castle Rock
10-12	Nutrition	Colorado Springs (Mitchell)

Over the past three years, records kept during the teaching of these integrated units reveal the following:

- high interest and motivation of students and teachers
- increased attendance
- increased community involvement
- greater participation of students in the learning process
- acceptance of student responsibility for learning
- more efficient use of time
- better attitudes towards learning and school
- greater interaction and cooperation among students
- development of peer teaching techniques
- more cooperation among participating teachers
- emphasis on the process of learning as well as knowledge acquisition
- practice of higher order thinking skills
- development of lifelong learning skills such as self-responsibility and direction, independent study research and time management skills

A Guidebook to Developing Interdisciplinary Units

The Grand Junction Schools, District 51, prepared these guides for grades 6, 7, and 8 in 1985. The guides provide teachers with a systematic approach for constructing interdisciplinary units and provides specific examples of some locally developed units.

The guides provide a resource from which teachers are encouraged to select the content most appropriate for their situation and to build upon that content.

Outdoor Education Centers

Interdisciplinary learning fulfilled in a natural environment distinguishes all centers. The approach is holistic and bridges language arts, mathematics, social studies, fine arts and foreign languages with science, physical education, and health. Centers may be used for a single day or overnight experiences and are operated by a school, county, or recreation district.

Balarat Outdoor Education Center, Denver Public Schools, Jamestown.

Barr Lake Nature Education Center, Colorado Divisions of Wildlife and Parks and Outdolor Recreation, 18 miles NE of Denver.

Colorado Outdoor Education Center, site of the annual spring Stalking Education in the Wild workshop, adjacent to the National Park Services, Florissant fossil beds.

Colorado State University Nature Center, Ft. Collins.

Greenway and Nature Center of Pueblo.

Holzworth Homestead, Rocky Mountain National Park, Grand Lake.

Jefferson County Conference and Nature Center, Lookout Mountain, Golden.

Keystone Science School, Keystone Center, Keystone.

McGregor Ranch, Rocky Mountain National Park, Estes Park, Northern Colorado BOCES.

Northglenn-/hornton's Park Creek Outdoor Education Facility, Hidden Valley, Allenspark. (in development)

Pingree Park, Colorado State University, above Ft. Collins.

The Plains Conservation Center, West Arapahoe Soil Conservation District, Aurora/Cherry Creek.

White House Ranch, Department of Parks and Recreation, Colorado Springs.

Physical Education and Humanities Project

Menz Sana and Corpre Sano is an interdisciplinary project being conducted at Coronado High School, Colorado Springs, Colorado. This program is designed to stimulate student involvement in decision making processes, as well as developing and utilizing life skills in reading, writing, fitness, computer literacy and lifetime sport activities. Several community resources are being used to acquaint students with various aspects of sport and history, sport and humanities, fitness and computer science, and reading and writing skill improvement through the interdisciplinary approach.

Students involved in the program will meet all of the requirements of the approved physical education and humanities courses. They meet in a segment of time which is normally considered to be two daily periods. During this time they participate in both physical and academic activities as well as developing and carrying out their personalized educational plans as previously determined by the student in conference with his/her advisor.

Rocky Mountain Global Education Project

The Center for Teaching International Relations (CTIR) at the University of Denver has received funding from the Danforth Foundation for the purpose of establishing and coordinating the Rocky Mountain Global Education Project.

Global perspectives education introduces students to skills and competencies which are essential to understanding and participating in what has become an increasingly complex and interdependent world. Global perspectives education programs prepare students for citizenship in a world in which economic, political, and socio-cultural linkages between nation-states are increasing in scope and frequency.

Schools participating in the Project include:

- Δ School District No. 12, Adams County
- Δ Cherry Creek School District No. 5
- Δ Denver School District No. 1
- Δ Summit County School District No. RE-1
- Δ Boulder Valley School District RE-2
- Δ Poudre School District R-1
- Δ Park School District R-3

All teams selected to participate in the project form a nucleus of an ongoing support and consultation network for global education efforts in the Rocky Mountain region.

The Voyage of the MIMI

The Voyage of the MIMI is a joint venture of a college, the US Government and a private publishing house. A coherent set of materials focusing on the travels of a whaling ship, the MIMI, integrates three media: video, computer and print. Technology is integrated into the content of the program but there is a wide spectrum of computer and non-computer activities that move students from concrete experiences to abstract representations of science and math principles.

The materials utilize a piece of the real world--whales--as a theme and entry point into the study of related science and math topics; for example, conducting experiments about how light, sound and temperature affect the way whales live. There are many opportunities to delve off into topics in many subject areas.

Additional material available from Holt, Rinehart and Winston.

IDEA BANK

This section includes suggestions for further research, reading or resources. It is divided into four sections:

SUGGESTIONS AND RECOMMENDATIONS: General suggestions for thinking about interdisciplinary/integrated education and for implementing projects.

GUIDE FOR EVALUATION OF MATERIALS: Finding materials that "fit" with interdisciplinary/integrated projects is difficult and time consuming. Criteria are suggested as a means of identifying resources best suited for use in an integrated situation.

ERIC SEARCH: The CDE consultants (with the help of the state library personnel) conducted an ERIC search for articles appearing on interdisciplinary education. From this listing, articles of particular interest were chosen to be included in this resource guide. You will find the title, the author, the name and date of the publication in which the article appeared and a brief description of the article.

OTHER READINGS AND MATERIALS: Listed by title and annotated.

SUGGESTIONS AND RECOMMENDATIONS

- Start small and don't be afraid to take risks.
- Read and share articles about interdisciplinary education with staff members.
- Talk with other staff members about what you are already doing with an interdisciplinary focus.
- Involve other staff members in collaborative thinking, planning and problem solving. (After working with a school-wide integrated project, one teacher was heard to remark, "I didn't know I was working with so many creative and intelligent people!")
- Help develop attitudinal changes but be aware the change process is slow. Don't feel that everyone has to be in the same "frame of mind" before a project can be started.
- Participate in staff development opportunities such as college classes or staff development offerings. Ask questions to investigate interdisciplinary aspects.
- Provide for adequate planning time when developing units.
- Visit programs in other schools, write for more information and ask questions.
- Expand your thinking and be committed to growing professionally.
- Discover and utilize basic connections as you plan and identify ideas. Commonalities should be authentic, not forced.
- Think about processes rather than specific subjects.
- Organize around major themes which go beyond content areas (interdependence, constancy/change.)
- Plan teaching strategies to include variety (role playing, dramatization.)

- Design evaluation strategies which assess higher level thinking such as product evaluation, interviews or observations.

- Keep track of attendance records, student comments, amount of homework completed, attitude changes, instances of student self direction and responsibility that occur during the time you are working in an integrated atmosphere. This information is as important as grades in evaluating the success of your program.

- Remember to include the community in your plans. Many businesses are ready and willing to participate with time and money in innovative projects. Ask!

- Search for ways to move the walls of the classroom outward to remove the physical barriers to learning as much as possible.

- Consider carefully your educational reasons for having students participate in particular activities or deal with particular ideas. Be sure you can answer these questions: What do I want a student to gain from this activity? What specific skill, process or subject matter is the student learning from this activity? Relate your interdisciplinary work to the present curriculum whenever possible--AND write this all down so it becomes a matter of record.

- Put the burden of learning on the students. Don't spend hours searching for materials--allow the students the luxury of learning research and retrieval skills instead of keeping them all for yourself.

- Provide opportunities for students to teach each other, correct each other papers, respond to each other's learning process.

- Remember the importance of PR work. Take every opportunity to let the community know of your class' active involvement in their own learning. Call the newspaper when something particularly exciting is happening. Invite community leaders, school board members, parents, too.

GUIDE FOR EVALUATING MATERIALS

The following criteria are suggested as a means of identifying materials, staff development programs and resources best suited to an integrated approach.

✓ Facilitation is modeled.

✓ Material is presented in a process manner or is process oriented; that is, it is seen as part of a whole rather than an isolated fact, idea or concept.

✓ Materials open options rather than narrow choices or ideas; expansionist rather than reductionist.

✓ Good questions are provided rather than right answers.

✓ Long range and short range goals and philosophy are stated and are focused on what students should do rather than on what students should know or teachers should teach.

✓ Opportunities for synthesis of information or connections among information are provided rather than a focus on isolated knowledge as an end in itself.

✓ Opportunities for follow up are an integral part of the materials/staff development.

✓ A process rather than linear steps is provided for completing tasks.

✓ Resources are provided for further investigation and to find answers to questions generated.

✓ Opportunities for multi-task implementation exist to meet different kinds of learning styles--choices and options abound.

✓ Applications to real life situations are a focus, not a tacked-on afterthought.

ERIC SEARCH

Art Education through Historic Preservation
Sensat, Lloyd; Cizek, Eugene D.
School Arts, May 1985

An art/historic preservation program involving elementary and junior high school students working with college students. The students interpret and document a local architectural landmark.

The Astounding Stars
Montgomery, Angela; and Others
Instructor, Nov-Dec 1983

An interdisciplinary teaching unit combines information about myths associated with the zodiac signs and instructions for plotting the coordinates of stars.

The Best of All Possible Worlds: An Eighteenth Century Humanities Program
Naitove, Christine
Social Science Record, Spring, 1985

An intensive five-day all-day humanities course on 18th Century thought and culture for 8th graders that involved 11 different departments is described.

Bringing the World into the Math Class
Zaslavsky, Claudia
Curriculum Review, Jan-Feb 1985

Discusses methods for integrating mathematics with the study of culture and history to encourage awareness of its role in everyday life.

A Child's Approach to History
Levstik, Linda S.
Social Studies, Nov-Dec 1983

Through the use of history resource folders containing literature and primary source materials, elementary teachers involve children in historical issues.

A Composer Teams with Student Lyricists to Make History Live
Lichtmann, Curtis; Lewis, Barbara
Music Educators Journal, Oct 1985

Described is a joint music and social studies project in which junior high school students research historic events and write song lyrics.

Computers in my Curriculum? 18 Lesson Plans for Teaching Computer Awareness Without a Computer.
Bailey, Suzanne Powers, Jeffers, Marcia
Solano County School System, Fairfield, Calif, May 1983

Eighteen interrelated, sequential lesson plans and supporting materials for teaching computer literacy at the elementary and secondary levels are presented. Adaptable Grades 3-12

Contributions of Physical Activity to Mental Health
Dishman, Rod K.
Exercise and Mental Health, Washington, D. C.

Mental health gains in children, particularly increased self-esteem, accompany fitness training with little risk. This reinforces the mental health importance of regular exercise habits already believed important for cardiovascular health.

Creative Approaches to Teaching Reading through Art
Criscuolo, Nicholas P.
Art Education, Nov 1985

Fifteen activities that interrelate art and reading are described.

Creative Drama: Bridging the Gap between the Elementary School and the Art Museum
Michell, Monica
Children's Theatre Review, Jul 1985

Describes a pilot project that designed a teacher's guide integrating visits to an art museum with creative drama activities for a social studies unit on the American west.

A Creative Exchange
Christian, Tom
School Arts, Mar 1985

A creative exchange program between the art department and the creative writing and English department of two high schools is described. The creative writing class submitted their original poems to advanced art seminar students. The poems provided the foundation for an illustration assignment.

Curriculum Development for Gifted Children in Salt Lake City--An Evolving Door
Swicord, Barbara
Roeper Review, Feb 1984

The advantages of using a thematic, interdisciplinary approach within a program is cited. A curriculum map for developing curricula themes and/or process is included.

Curriculum Reviews
Science and Children, Oct 1983

Describes and assesses student/teacher materials, activities and quality of the TOPS science program and the "Come With Me" science series.

Curriculum Time for Physical Education?
Shephard, Roy J., Et al
Journal of Physical Education, Recreation and Dance, 1982

A controlled experiment in French Canada asks how much curricular time should be spent on physical education.

Discovery Activities for Awareness
Clearing: Nature and Learning in the Pacific Northwest, Dec-Jan 1986

Presents 20 activities designed to develop awareness, curiosity, and sensitivity in children through exploratory exercises of the home, community and natural world.

The Effect of Science and Mathematics Integration on Selected Seventh Grade Students' Attitudes Toward and Achievement in Science.
Friend, Harold
School Science and Mathematics, Oct 1985

This study sought to determine how integrating science and mathematics in a seventh-grade physics unit affected attitudes and achievement in science. Scientific attitudes of the integrated groups improved as did their achievement.

English by Any Name is Still Humanities
Ulbrichm, Mary
English Journal, Nov 1985

Points out that compostion and literature often can be best taught when combined with architecture, philosophy, music, or other subjects.

Environmental Education...In Any Subject for Any Age.
Baldauf, Richard J.
Nature Study, Mar 1984

Describes 14 slide presentations which demonstrate that environmental education can be approached through any subject at any grade level.

Environmental Studies Model
George, David R.
Review of Environmental Education Developments, Win 1986

Presents a model of an environmental studies course that reflects a spaceship earth philosophy. Suggests several interdisciplinary experiences that emphasize problem-solving and decision-making skills.

Evaluation of a Sociomusic Curriculum for Young Learners
Brunk, Valeria N.; Denton, Jon J.
Texas Tech Journal of Education, Win 1983

Results of an evaluation of a first grade curriculum plan that integrated social studies, science, and music concepts are reported. The study demonstrated the positive effects of the integrated curriculum on student achievement in all three subject areas.

Facets: Humanities and the English Teacher
English Journal, Nov 1985

Four teachers comment on the humanities as works of art, ways to use multimedia programs in emphaizing the humanities, the lifelong influence of one humanities course, and the need to concentrate on each separate humanities discipline in teaching an interdisciplinary course.

Four Music Activities to Sharpen Language Skills
Smith, John A.
Music Educators Journal, Nov 1984

Establishing music as an integral part of the elementary curriculum is one of the most pressing challenges facing music educators. Four music activities which can be used with elementary students to reinforce reading activities are described.

From Science into Art
Weigand, Herbert
Art Education, Nov 1985

Assignments that enable elementary students to focus on a natural phenomenon, understand it in scientific terms, and develop a drawing or painting based upon it are suggested.

The Fusion of Artistic and Scientific Thinking
Adams, Dennis, Fuchs, Mary
Art Education, Nov 1985

Educators need to include technology within the liberal arts. Educators must modify how they think about sientific and technical problems, recognizing that the arts and humanities sharpen analytical and perceptual skills.

Guide to Curriculum Planning in Environmental Education
Wisconsin State Department of Public Instruction
1985

This guide is designed to provide assistance and support to school districts for the development of a comprehensive K-12 environmental education program. Infusion of environmental topics into all curricular areas is recommended.

How the Arts Can Be Central to Classroom Learning
Davies, Rita
Learning, Jan 1985

A close involvement with the arts helps students develop skills useful for any area of the curriculum. Techniques are suggested for making the arts more than just extracurricular activities.

How to Create Your Own "Skills-Oriented" History Curriculum
Naitove, Christine; Bartle, Barbara
Social Science Record, Spr 1984

A lesson on the French Revolution integrates reading, writing, reasoning, and researching skills into history instruction.

How to Do It: Studying History Through Art
Suynal, Cynthia; Hatcher, Barbara
Social Education, Apr-May 1986

Describes how to initiate an interdisciplinary social studies-art program which assists children in their personal construction of social knowledge.

Improving Reading Skills through Elementary Art Experiences
Van Buren, Becky
Art Education, Jan 1986

Learning that involves art experiences is more interesting and fun for children. Some strategies are discussed, and some existing art/reading programs described.

The Infusion of Multicultural Teaching in the Classroom
Yao, Esther Lee
Action in Teacher Education, Fall 1984

Multicultural education can be infused into the existing curriculum to help students become less ethnocentric and more cosmopolitan.

An Integrated Teaching Module
Samuel, Marie R.; Seiferth, Berniece B.
Nov 1983

This integrated teaching module provides elementary and junior high school teachers with a hands-on approach to studying the Anasazi Indian.

Integrating Biology and English
Leeper, Faye
American Biology Teacher, May 1984

Discusses strategies used to integrate the teaching of high school biology and English. One major effort involved students writing and/or modifying the scripts for slide and filmstrip presentation.

Integrating Cardiovascular Health Education with an English Curriculum in a Secondary School.
Holcomb, J. David
Journal of School Health, Oct 1984

The impact on cognitive and attitude retention of a cardiovascular health education unit that was integrated with high school English classes was studied. Results indicate that joint effort between health education and liberal arts assists students in retaining facts related to cardiovascular health.

Integration: Friend or Foe of Art Education
Freyberger, Ruth M.
Art Education, Nov 1985

In times past, art instruction for young children was integrated with other subject matters. Integration provides more meaningful experiences than can be achieved through separate study of narrowly defined subjects.

Investigate a Culture: Map, Research, Present and Write
Turvey, Joel S.
English Journal, Jan 1986

Describes a unit involving seventh grade students in an investigation of another culture. The unit helps students learn how to appreciate a different culture and that allows them to practice their language arts skills across the curriculum.

Learning by Doing: A Student Museum
Elzey, Lynn Colter
School Arts, May 1983

An elementary school art museum, directed, staffed, and supplied by students, is described.

Letter Writing for Outdoor Education
Foster, Herbert L.
Outdoor Communicator, Spr-Sum 1985

Six types of letter writing activities providing basic writing skill practice that can be incorporated into outdoor education programs.

Linking Reading/Language Arts and Math
Russo, Mary; Rubino, Nicholas
Equity and Choice, Win 1986

Desribes how classrooms can "talk the language of" and "write about" mathematics concepts and procedures,thereby demystifying the abstraction of math and, at the same time, developing literacy skills.

Master Builders, Move Over, Frank Lloyd Wright
Carter, Beth
Arithmetic Teacher, Sep 1985

Building projects with blocks provide opportunities to foster creative thinking skills. The connection between blocks and thinking and how to implement the strategy are included along with examples.

Math and Humane Education
Dewey, Paul
Children and Animals, Dec 1985

Explains how Venn diagrams can be used to teach children about animals.

Mathematics: A Vehicle for Better Global Understanding
Swetz, Frank J.
Mathematics Teacher, Mar 1985

The various roles and uses of mathematics in developing global awareness in students are considered.

Mathematics Students Have a Right to Write
Shaw, Joan Guelig
Arithmetic Teacher, May 1983

Incorporating writing into mathematics classes is promoted, with numerous sugestions on using writing to help students recall procedures, develop story problems, and plan computer programs, among other things.

Medicine Wheels: The Art and Culture of the Plains Indian. An Interdisciplinary Unit for Seventh-Grade Students Involving Art, Social Studies, and Mathematics
Britton, Jeanette
Seattle Public Schools, Washington, Mar 1983

This unit focuses on a study of the art forms, symbols, designs, and colors of the traditional art form of the Plains Indians--the Medicine Wheel.

The Mini-Society and Mathematical Reasoning: An Explanatory Study
Ortiz, Ellen; Kourilsky, Marilyn
Social Studies Review, Spr 1985

In this mini-society program, intermediate grade students create their own microcosmic version of an adult economy.

The Olympics: An Educational Opportunity
Krasevec, Joseph A.
Journal of Physical Education, Recreation & Dance, Feb 1984

School children can learn more about the values of the Olympic Games and sports participation through special instruction materials entitled "The Olympics: An Educational Opportunity." Three curriculum guides are described.

Opting for "Newthink"--Interdisciplinary English in the Decades Ahead
Wolfe, Denny
English Journal, Oct 1984

Calls for a reintegration of the language arts in order to improve students' learning.

Outdoor Education Activities for Elementary School Students
Lee, Connie L.
ERIC Clearning House on Rural Education and Small Schools, Las Cruces, New Mexico, Mar 1984

This publication discusses the need for and the focus of outdoor education, outlines six school ground activities adaptable to any elementary grade level, and provides specific language arts, social studies, science, health, mathematics, art, and music projects for each outdoor activity.

Physical Education Self-Concept and Achievement
Pangrazi, Robert
Journal of Physical Education, Recreation and Dance, Nov/Dec 1982

There appears to be a low but significant relationship between reading and mathematical abilities and selected motor performance variables. These data suggest that inclusion of specific motor developmental activities as well as games and rhythms in the elementary school physical education curriculum might enhance academic performance.

Poverty + Hunger = Global Issues
Schwartz, Richard H.
Journal of Geography, Mar-Apr 1983

Five sample problems concerning population, poverty, waste, the arms race, and hunger are presented. The global issue related to each problem is discussed, and the solution and mathematical skill are provided.

Putting Our Curriculum "Backs" Together
Windsor, Richard E.; Wold, Dond C.
North Central Association Quarterly, Sum 1983

Recommends curriculum clustering as a way of giving definition and meaning to secondary curricula lacking cohesiveness and academic depth.

Rekindling Scientific Curiosity.
Coble, Charles R.; Rice, Dale R.
Science Teacher, Feb 1983

Examples of how scientific concepts and society-related issues can be taught in the same class are presented.

The Role of Industrial Arts/Technology Education for Student Development in Mathematics, Science, and Other School Subjects.
Maley, Donald
Technology Teacher, Nov 1984

Points out how the study of technology infuses broad areas of the curriculum, particularly mathematics and science.

Supporting Rationale for Elementary School Physical Education
Hanson, Margie R.
Proceedings--American Academy of Physical Education, 1974

An extensive study conducted at UCLA on three and four year olds reveals that cognitive learning based on multi-sensory experiences i more effective than that based on sedentary academic tasks. Movement oriented programs result in a significant decrease in anxiety; producing a feeling of well-being which allows the child to integrate learning within himself more effectively.

Take a Birds-Eye View
Gurley, Laine I.
Science and Children, Sep 1983

Describes an interdisciplinary ornithology unit grades 4-6.

Teaching Young Historians How to Read, Write, Interview and Compute
Caldwell, JoAnn
Social Studies Review, Win 1984

The Young Historian project provides abundant opportunities for students in grades 1 through 6 to apply basic reading, writing, listening, speaking and computing skills learned during reading and math and to learn firsthand about their own heritage and the many resources in their own community.

Themes
Kessen, Rosanne
North Dakota University
Insights into Open Education, Oct 1983

The process of webbing is described as a valuable technique for organizing teaching activities around a theme. Instructions are provided for 12 follow-up art activities.

What High School Teachers Have to Say about Student Writing and Language Across the Curriculum
Gambell, Trevor J.
English Journal, Sep 1984

Describes the difficulties students have in using language in the areas of math, social studies, science, and English.

Whatever Happened to Language Across the Curriculum?
French, Jim
Education Canada, Win 1985

Reviews articles published on the topic of language across the curriculum from 1979-1984.

Writing Across the Curriclum at All Grade Levels: A State Mandated Revolution in Writing Instruction
Healy, Mary K.
Teacher Education Quarterly, Sum 1983

Research shows that writing can be used across the curriculum to help students come to grips with their understanding (or lack of understanding) of information presented in each day's lessons. Teachers of all subjects and at all grade levels should be trained to understand the writing process and its importance for learning.

Writing to Learn: A Message for History and Social Studies TEachers.
Goggin, William F.
Social Studies, Jul-Aug 1985

Strategies to help social studies teachers integrate writing into their classes are suggested. These include student journals, focused freewriting, written assignments used for review, creative book reports, poems, short stories and songs.

ADDITIONAL READINGS AND MATERIALS

"Agriculture in Colorado." Colorado Department of Agriculture, and CDE, C & I Unit.

> A lesson plan for teaching conservation concepts utilizing the areas of language arts, social studies, science, mathematics and art. Available jointly from CDE, CDA.

"Art as Language: Its Place in the Schools." Ernest L. Boyer. Beyond Creating: The Place for Art in America's Schools, Getty Center for Education in the Arts, 1985.

> Suggests that art education is basic because it extends language by enlarging the store of the images we use and makes our understanding discriminating and comprehensive.

The Arts, Cognition and Basic Skills. Edited by Stanley S. Madeja. St. Louis: Central Midwestern Regional Educational Lab; Inc., 1978.

> An investigation of how the arts are related to cognition and basic skills and how research in the arts and aesthetics relates to arts education.

Basic Skills in the Content Areas, A Staff Development Guide, 1983, John Hockett, Tom Edwards, John Sharpham, Don Roderick, Cheryl Millar.

> Funds to support this activity were provided by Chapter II, Education and Consolidation and Improvement Act (Block Grant) to the Illinois State Board of Education. A program was developed to identify skill strands common to all curricular areas and activities which demonstrate that curricula is related reardless of content.

Beyond Creating: The Place for Arts in America's Schools, J. Paul Getty Trust, 1985.

> An introduction to the concept of discipline based art education which integrates art history, art production, art criticism and aesthetics.

"Caribbean Festival." *Social Science Record,* Fall, 1983.

Describes an all-school integrated study of the Caribbean. The study culminated in a week-long Caribbean Festival for the entire community.

Chrysalis: Nurturing Creative and Independent Thought in Children, Grades 4-12. Micki McKisson. Zephyr Press Learning Materials, Tucson, Arizona, 1983.

Composed of eight units on a variety of themes (Healthy Body-Healthy Mind, Unexplained Phenomena, World of Beauty, Fine Arts, Understanding World Problems, Independent Learning, Thinking and Feelings); emphasis is placed upon student self-direction.

The CLASS Project (Conservation Learning Activities for Science and Social Studies), John C. Stone, National Wildlife Federation.

A series of junior high investigations and projects covering six content areas: Energy Use, Environmental Issues, Forest / Watershed Management, Hazardous Substances, Wetlands, Wildlife Habitat Management; for use as supplementary materials. The skills acquired lead toward involvement in community action projects.

Cognition and Curriculum: A Basis for Deciding What to Teach. Eliot Eisner. New York: Longman, Inc., 1982.

Provides an overview of cognition research and its application to curriculum planning.

Colorado Energy and Resource Educators, Inc., ERE, an association representing public utilities, the private sector, and independent professionals coordinated by Janet Bender-Keigley, Estes Park.

The organization's primary goal is to work with teachers in updating knowledge on energy issues and to provide energy education resources through lectures, demonstrations and speakers' presentations and to provide materials from a variety of sources. The materials as well as the summer annual Colorado Energy Leadership Institute stress how to integrate energy concepts into most discipline areas.

Colorado Model for Conservation Education. David and Helen Loth and George Ek, CDE

> A two volume guide for teaching conservation in Colorado. Its purpose is to promote stewardship.

Conservation for Children. Available through the National Diffusion Network, Northern Colorado BOCES

> Designed to increase awareness, understanding, and action by providing an opportunity for all students to gain basic knowledge in conserving natural resources and energy that will aid them in planning and caring for our environment.

Conserving Soil: Program information available from the Soil Conservation Service Field Office under the U. S. Department of Agriculture.

> A publication designed as enrichment material for grades 6 - 9 with a teacher's guide, spirit duplicating masters and transparencies. There is a balance of in-class and outdoor interdisciplinary learning experiences about soils.

Consortium. The Newsletter of the Consortium for Mathematics and Its Applications. Published quarterly, available by writing Consortium, 60 Lowell Street, Arlington, MA 02174; (617) 641-2600.

Dance Related to other Curricular Areas. Available from CDE.

> Presents a sampling of how dance can enrich the total learning process. Specific activities for K-8 dance activities in language arts, math, science, social studies, fine arts, health, and physical education are provided.

"Design for a New Academy: An End to Division by Department." Frederick Turner. *Harper's Magazine,* September, 1986.

> A call for a change in the fundamental paradigms of study and in the nature and function of the academy itself.

"Designing Interdisciplinary Studies Programs," A Project Search Development. The University of the State of New York, The Board of Regents, Albany, New York, 1976.

Offers teachers from different disciplines help in setting goals, and designing teaching/learning experiences. Addresses the essential aspects of contemporary humanities education.

Developing Minds: A Resource Book for Teaching Thinking. Edited by Arthur L. Costa. Association for Supervision and Curriculum Development, Alexandria, Virginia, 1985.

Includes theory, rationale, definitions, explanation of currently available thinking skill programs, a plethora of resources and methods of evaluating present practices.

"Dispelling Outmoded Beliefs About Student Learning." Kenneth Dunn and Rita Dunn. *Educational Leadership*. March 1987.

Identifies research that challenges 15 popular beliefs about student learning. Suggests methods of matching instruction and learning context to learning style.

Energy, Food and You. Tony Angell, WA State Office of Environmental Education, 2000 NE Perkins Way, Seattle 98155.

Two books (K-8 and 7-12) combine nationally recognized energy lessons with fundamental nutrition information. Rationale is provided.

"Foreign Language and International Studies High Schools," ERIC DIGEST, Clearinghouse on Languages and Linquistics, October, 1985.

Provides information on magnet schools preparing students to participate in an international environment. Discusses the organization, funding, problems, and numbers of schools serving this purpose.

4-H/Ding Darling Project, 32 Curtis Hall, Iowa State University, Ames, Iowa 50011.

A series of 30 teacher plans, 10 each in areas of soil, water and wildlife from grades 5-8. A "Ding" Darling cartoon interpretation activity, 12 creative "Find Out" cards, 7 other hands-on activities and a filmstrip lead to a culminating computer program that applies the knowledge learned to a problem solving activity.

Global Science: Energy, Resources, and Environment by John W. Christensen. Kendall/Hunt Publishing Co., Dubuque IA 52001.

A secondary science program to aid students' understanding of energy and environment. With special emphasis on developing basic energy/resource concepts, ERE examines traditional energy sources and consumption patterns while analyzing alternatives for the future.

Guide to Colorado's State Wildlife Areas. Colorado Division of Wildlife, Denver. $2.00.

A listing of 222 Division of Wildlife properties with 21 maps showing 37 selected state wildlife areas.

"Horizontal Coordination, Foreign Languages, and Social Studies: An Editorial." Howard Lee Nostrand. *The Modern Language Journal*, 69, 1985.

Discusses the advantages of attaching what students learn about foreign people to what is being learned in other subjects.

"Integrating Curriculum for Tomorrow's Students." Ruth Keitz. *Educational Leadership*, December 1986/January 1987.

The Anchorage, Alaska School District assessed the impact of social change on the lives of students, transformed curriculum review from a fragmented to a holistic process, and found new ways to link disciplines with skills for critical thinking and humane living.

Integration: Its Meaning and Application. L. Thomas Hopkins. New York: D. Appleton-Century Company, 1937.

Provides information on the many kinds of interdisciplinary programs in use in the late 1930's.

"Interdisciplinary Education Involving the Arts." Visual and Performing Arts Framework, California State Department of Education, 1982.

Includes suggestions for interrelating the arts and for integrating one or more of the arts with other areas of the curriculum. Provides examples of content and the procedures that might be used.

Making Good . . . on the promise of public education, A report from the teachers and administrators of the 1986 Colorado Governor's Institute for Educators.

A position paper stating the ideas that recipients of the Colorado Governor's Awards for Excellence in Education think should be at the center of efforts to reform public education.

Marine Science Project. National Diffusion Network, Northern Colorado BOCES

Offers complete, self-contained marine education curricula for grades 2, 4, 6 and middle and high school levels. Guides are designed to improve scientific, reading and computational skills while inreasing the observational powers of the student.

Naturescope, published bi-monthly during the school year. National Wildlife Federation, 1412 16th Street, NE, Washington DC 20036. $18.00 a year.

An activity series for teachers, nature centers, and youth leaders. Emphasizes discovery of fascinating facts and puzzles, pictures, stories, songs, and crafts. Each issue features a nature subject: i.e., astronomy, dinosaurs, reptiles, etc.

Outlook: Environmental Education Enrichment, Iowa Department of Public Instruction, Grime State Office Building, Des Moines, IA 50319.

K-12 activities developed about 11 topic/issue spheres: Production and Distribution, Human Habitat, Heritage and Land Use interfaced with aesthetics, interdependence, cultural evolution, energy flow, life styles and stewardship. Matrix progresses from early concrete to concrete to formal.

Physical Education in the Content Areas. A Guide to Curricular Planning in Physical Education. Wisconsin Department of Public Instruction.

Suggests methods of using PE in the areas of math, listening and speaking skills, science, health education, environmental education and career education.

"Project Aims." Fresno Pacific College, Math-Science Project Office.

Provides reasons for integrating math and science and provides curricular materials.

Project Learning Tree. Conservation Education Services and the Colorado State Forest Service.

A nationally sponsored program allowing teachers to integrate environmental education into their existing curriculum. A source of over 170 supplementary and interdisciplinary lessons and activities.

Project Wild. Colorado Division of Wildlife.

A K-12 supplementary, interdisciplinary instructional program incorporating concepts related to people, wildlife, and a health environment into all major school subjects and skill areas. Addresses the need for human beings to develop as responsible members of the ecosystem.

"The Psychomotor Base for Reading. Alfred J. Ciani and Rita M. Klenke. Reading Improvement.

Explains five areas where reading is related to the psychomotor domain: space, laterality, directionality, following directions, and self-concept. Possible relationships between the psychomotor domain and reading are discussed and methodological implications for the teaching of reading are introduced.

A Sand County Almanac "and Sketches Here and There," Aldo Leopold Oxford University Press, New York, 1949.

Published posthumously, the almanac captures the thoughts of a lifetime of what many feel is America's foremost ecologist. Leopold saw the extension of moral principles and values from people to land as a necessity.

Schools of the Future. Marvin Cetron, New York: McGraw Hill, 1985.

This study looks at current trends and envisions their logical application in the schools of the future.

"Science Teaches Basic Skills." Kenneth R. Mechling and Donna L. Oliver. National Science Teachers Association, Washington, D.C., 1983.

Provides rationale for the teaching of science as the fourth "r" because it teaches basic skills which enhancing those learned in other curricular areas.

"Social Studies and Foreign Languages: Strengthening the Bonds Between Us." Anna Ochoa and Lorraine Strasheim. *Social Education*, February, 1983.

Discusses moves toward multidisciplinary curricular collaboration because of a belief that global literacy is a task for all.

"Social Studies and Language: A Partnership." Donald Bragaw and Helene Loew. *Social Education,* February, 1985.

Presents a definitive overview, suggests a curriculum guide, lists areas of cooperation, defines a cooperative project, and presents constraints on such efforts.

SPACES, Solving Problems of Access to Careers in Engineering and Science. Lawrence Hall of Science, Univ of CA, Berkeley,

Includes 32 activities to develop problem-solving skills and logical reasoning. Appropriate for grades 4-10.

State of the World, published annually by the Worldwatch Institute, 1776 Massachusetts Ave., NW, Washington DC 20036.

> Yearly reports measure worldwild progress in achieving sustainability--the extent to which our economic and social systems successfully adjust to change in the underlying natural resource base.

"A Statewide Approach to Measuring Critical Thinking Skills." Robert J. Sternberg and Joan B. Baron. *Educationa. Leadership*, October 1985.

> Describes a 4th grade master test that assesses thinking skills developed by Connecticut State Department of Education, a testing corporation, and cognitive psychologists.

Task Force Reports. Colorado Department of Education Curricular Task Forces.

> Reports from each of the subject area task forces in the State of Colorado are available from the Curriculum and Instruction Unit, Colorado Department of Education.

"Teaching About Energy." Volume 1, Enterprise for Education, Inc., Santa Monica, California, 1985.

> A "basic skills" program introducing energy education to 7th, 8th, and 9th graders.

"Technology and Curriculum: Will the Promised Revolution Take Place?" Charles Mojkowski. *NASSP Bulletin*, February 1987.

> Supports the serious integration of new technology into the curriculum for change with improvement.

Unicorns are Real: A Right Brained Approach to Learning and Free Flight. Barbara Meister Vitale. Jalmar Press, California 1982.

> Activities cover everything from mathematics to reading to spelling to keeping a closet neat. Imaginative and creative ideas for reaching children who have difficulty learning in

structured and auditory classrooms.

"Various Possibilities for Space Study Content in the Area of English." Andrew Wayman. Available from John Akey, U.S. Space Foundation, Colorado Springs.

Rationale, examples, and suggestions for teaching space studies in the area of English.

"Vocabulary on the Playground." Stephen Klesius. College of Education, University of South Florida, Tampa.

Explores procedures for developing vocabulary using physical education activities. Available from CDE C & I unit.

A Whack on the Side of the Head: How to Unlock Your mind for Innovation, and A Kick in the Seat of the Pants: Using Your Explorer, Artist, Judge & Warrior to be More Creative. Roger Van Oech. Warner Books, New York, 1984.

Presents exercises and ideas for bringing innovative and creative ideas to the forefront. A good resource for activities for children as well as help in developing the teacher's creative powers.

Writing for Learning in the Content Areas. Denny Wolfe and Robert Reising. J. Weston Walch, Publisher, Portland, Maine, 1983.

Sections include information on process writing, using journals, writing to accomplish instructional goals, evaluating writing, and student activity pages. Addresses writing as a way of knowing and learning as well as in the Englishm social studies, math/science, business and voc ed curriculum.

"Writing Games in the Bayeux Tapestry." John Marshall Carter. *Momentum*, December, 1985.

Suggests teachers use the Bayeux Tapestry as a teaching tool for western and world civilization, medieval history, art, and English and French literature classes. Nestled within the borders of the 230 foot long by 20 inches wide "document" is a medieval universe full of writing games. Specific, concrete suggestions follow for the use of the tapestry in every subject area.

Writing the Natural Way: Using Right Brain Techniques to Release Your Expressive Powers. Gabriele Lusser Rico. Houghton Mifflin Company, 1983.

Extended activities in clustering techniques and suggestions for use as prewriting activities, organizational strategies, and information retrieval.

"Writing Skills for Science Labs." Marjorie Fink Vargas. *Science Teacher,* November, 1986.

Provides a one-period exercise to introduce students to "point of view" and "voice" as writing techniques useful when writing lab reports.

You, Me and Technology, Agency for Instructional Technology, Box A, Bloomington, IN 47402-0120.

This award-winning curriculum uses instructional video to help students become effective citizens by teaching them what technology is, the interactions between technology and society, technology's impact on individuals, and the moral view of technology. Teacher's guides contain interdisciplinary activities.

Zoobooks, P. O. Box 28870, San Diego CA 92128. Ten monthly issues for $14.00.

Addresses individual species of wildlife matching colored drawings and easily read and understood text with phonotographs and detailed illustrations.

HELPING STUDENTS WRITE ANSWERS TO ESSAY QUESTIONS

A. Recognize the areas in which students need the most help:

1. Recognizing and accumulating the necessary information. Help them by giving them plenty of practice.

Confront them with:	Readings	Have them:	Translate
	Graph		Interpret
	Charts		Extrapolate
	Records		Analyze
	Films		Evaluate

2. Organizing information:

   a. Help them organize thoughts through written questions clearly stated and free of ambiquities.
   b. Use open book method.
   c. Use class discussion and notes.
   d. Teach the writing process and ask them to use it.

B. Provide help in determining exactly what the question is asking. Analyze the key words in the question to help the writer determine the best logical method for organizing the answer.

1. **Explain**: Assume the reader knows nothing and that you must convince him or her that you understand the subject.

2. **Discuss**: Present all evidence supporting both sides of the issue.

3. **State**: Present the information called for as briefly and accurately as possible.

4. **Describe**: Narrate or give an account of an episode.

5. **Contrast**: Show only the differences between the items mentioned.

6. **Compare**: Show only the similarities between the items mentioned.

7. **Illustrate**: Give examples.

C. Ask students to use basic essay form.

1. Introduction

   a. State the author's opinion. (Using the same wording as the question will help the author to focus thoughts on the topic. For example, if the question asks students to "Compare the Presidencies of Washington and Jefferson," a good beginning statement might be: "There are several comparisons that can be made between the Presidencies of Washington and Jefferson.")
   b. Give an indication of the major points to be covered.

2. Body

   a. Arguments
   b. Details of evidence
   c. Statements must be supported by facts that are relevant, adequate, and correct.

3. Conclusion: Restate the main point with a brief, concluding remark.

D. Impose some artificial but useful writing conditions:

1. Require an outline.
2. Use only the amount of paper specified for writing.

   BUT DON'T IMPOSE A TIME LIMIT. Limited time adds pressure that interferes with student reflection. Tightly organized, thoughtful answers to good essay questions require time.

GAMES AND ACTIVITIES THAT ENHANCE ACADEMIC SKILLS

Physical education provides a unique contribution toward achieving educational goals of both elementary and secondary education students. Early in the developmental process, the child develops a movement vocabulary that serves as a primary base for future psychomotor as well as cognitive development. Through the medium of play, the child learns how to move as well as how to relate such movement to various activities. Learning in one area, such as math, can be strengthened by movement activities as when one is counting scores in a game of capture the pin.

Research reported by Humphries (1975) and Cratty (1971) strongly supports the idea that children seem to learn various academic concepts more effectively through the motor activity mode than through the traditional academic medium. This is particularly true for children who tend to have average or below average levels of intelligence.

The following is a list of games and activities that may be used to enhance academic skills.

Activity	**Concept or Skill**
Mathematics	
Squirrel in Trees	Sets
Call Ball	Number recognition
Musical Chairs	One less than
Rope Ball	Adding
Dodgeball	Subtraction
Juggle a Number	Dividing
Eight-legged Caterpillar	Dividing
Language Arts	
Old Mother Witch	Speaking
Birds and Cats	Remembering, Speaking
Do As I Ask	Listening
Hopscotch	Letter Recognition
Charades	Spelling
Bumblebee	Speaking

Activity	Concept or Skill
Art and Music	
Musical Chairs	Sequencing
Marching	Basic Element Time Patterns
Warm up Activities	Moving to Music
Construct Musical Instruments for use in Creative Dance	
Draw Movement Sequences Performed in a Gymnastic Activity or Dance	
Science	
Gravity	Wide Base, Balance
Levers	Class Levers-1st, 2nd & 3rd
Stabilizers	Understanding support systems
Motion	Stopping and Starting Concepts
Force	Directional Force, Jumping, Throwing

The items listed above are just a few of the many possibilities that exist for presenting an interdisciplinary approach to relating physical education to the academic area. We must keep in mind that the child's strongest modality for learning is in the area of gross motor development. Why, then, don't we use that area of strength as a means of developing interest and motivation necessary to make every child a winner regardless of the subject matter we are trying to teach.

REFERENCES

Cratty, B. J., Active Learning, Englewood Cliffs, N. J.: Prentice-Hall, 1971.

Humphrey, J. H., Education of Children Through Motor Activity, Springfield, Illinois: Charles C. Thomas, 1975.

REFERENCE SOURCES-INTEGRATING PHYSICAL EDUCATION WITH OTHER SUBJECTS

Barlin, A., and Barlin, P., The Art of Learning Through Movement, Los Angeles: Fearson Publishers, 1974.

Blatt, G. T., and Cunningham, J., It's Yur Move: Expressive Movement Activities for the Language Arts Class, New York: Teachers College Press, 1981.

Cratty, B. J., Learning About Human Behavior. Englewood Cliffs, N.J.: Prentice-Hall, 1975.

Dienes, Z.D., Mathematics Through the Senses, Games, Dance and Art, Atlantic Highlands, N.J.: Humanities Press, 1973.

Doray, M., J is for Jumping: Moving Into Language Arts, Belmont, Calif.: Pitman Learning, Inc., 1982.

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Gilbert, A. G., Teaching the Three Rs Through Movement Experiences, Minneapolis, Minn,: Burgess Publishing Co., 1977.

Hall, T., Academic Ropes, Byron, Calif.: Front Row Experience, 1981.

Werner, P, H., and Burton, E.C., Learning Through Movement: Teaching Cognitive Content Through Physical Activities, St. Louis: C. V. Mosby Co., 1979.

A PROCESS TO PERSONALIZE LEARNING

A long-term, comprehensive effort to transform schooling at the building level.

This project represents a systematic effort to apply the best of what we know from current educational research and good practice toward enhancing the total climate for learning in a school and to transform the structures of schooling in the interest of personalized learning for every student.

Personalized learning acknowledges that students are unique. There are those identified as "academically gifted," capable of performing in school tasks well beyond their age-grade peers. Other students exhibit extraordinary creativeness, and their divergence of expression invites a different pathway for inquiry than that of their fellow students. There are those identified as "learning impaired," some of whom have considerable talents yet unrevealed. Also, there are the high risk, low-achieving, delinquency prone students with great potential for gifted behavior. And beyond these S.O.S. students* who clearly signal a need for special services, there are many others whose differences are less visible but whose learning needs also abjure any lockstep system of learning which daily delimits their individuality.

Personalized learning every day for each of these students ought not to be regarded perennially as an impossible dream; nor should a school's verbal commitment to

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*S.O.S. Students--Those students described a being "Significantly Out of Sync" with the existing structures of schooling and for whom the normative learning settings, content, instructional practices and procedures may be regarded presently as being inappropriate and non-responsive to their individual educational strengths and learning needs.

the greater development of human potential be viewed as

empty rhetoric. But to personalize learning in any signficant way may require a rethinking of how schools might better function and a restructuring of those parts presently more attuned to the needs of an Industrial Era. Given time and planing--and above all, a consensus as to general direction and some specificity of expected outcomes--personalized learning is possible, indeed, vital if our society is to prosper in the 21st Century.

The project initially involves three or four teachers and the principal at each participating school who, together, as a Pilot Program Group focus their attention on ways to increase the effective functioning of six School Climate Determinants in the school. These determinants which impact the instructional setting are:

- Active Learning
- Individualized Performance Expectations
- Varied Learning Environments
- Flexible Curriculum and extra-curricular activities
- Support and structure appropriate to the learner's maturity
- Effective teaching-learning strategies

A set of guidelines or a planning model that is being used to monitor and to confirm the operation of these six determinants is identified through the mnemonic, **PSSSST**.

PSSSST stands for:

Purposes - The set of educational expectations or objectives we have for our students - what do we want them to learn? What, equally important, do they tell us they wish to learn?

Students - Each of our young people is unique--in a very special way with learning strengths as well as limitations that need to be addressed through activities and experiences appropriate to their individual needs.

"Stuff" - The resources and activities students engage in ought to be responsive to the range of different ways they access and process information.

Strategies - Instructional strategies ought to be tailored to the range of student learning needs we already have identified.

Space - Students' differences of learning style as well as task needs require that learning spaces be varied.

Time - Learning time must vary depending upon the specific task as well as performance capabilities and interests of different students.

The thread running through each of the PSSST elements is that of appropriate differentiation. Just as no one diet can serve well every person's health, no one instructional strategy or resource will likely respond to the special important differences that attend each of us in the way we process information and learn.

To examine **PSSSST** in detail, each building team is engaged in a number of staff development sessions over several years, each of one or two days duration. Specific topics for study presently include:

•Learning how to assist in managing change.

•Diagnosing student learning needs more effectively and determining alternative strategies to meet them.

•Applying elements of successful instruction consciously and systematically in every day teaching in order to strengthen new learning and sustain that learning over time.

•Applying our understanding of principles of developmental psychology to instructional practice.

•Improving our ability to strengthen students' logical reasoning and creative thinking abilities.

•Applying varied grouping patterns to different task needs of students.

•Identifying ways to organize our existing staff/learning spaces/learning time to increase each student's achievement and satisfaction.

•Improving procedures of program evaluation.

•Improving skills in instructional management.

Team membership rotates periodically to invite increased ownership from all staff members. As each team's members improve their skills and knowledge through the above studies, they will also be sharing what they have learned with all other staff members. The long-term project expectation is that to the extent the entire school "orchestrates" its skills toward agreed-upon purposes and applies those skills collaboratively to increase the functioning of the six School Climate Determinants - then student productivity and satisfaction will be high and personalized learning may become more of a reality. In sum, this project seeks to accomplish substantive organizational change over an extended period of time. It must have the support and commitment of the district's board of education and administration as well as the staff, parents and signficant others for that attendance area.

What evidences of transformation might we anticipate over five to ten years of intensive, cooperative, committed effort? These might include - but would not be limited to:

•A fully functioning, representative, building-level management team owning the vision of what futures schooling might be and providing ongoing support and leadership to accomplish it.

•"House level" budgeting - providing decentralized management with accountability for "houses" of 100-150 students each facilitated by teams of professional personnel.

•Differential staffing (within and across houses). A complement of staff specialists by discipline plus support personnel including apprentice teachers, aides, community resource persons, etc.

•Space organized within (and across) houses by task designation. This signals the demise of "the classroom" as a singular space sustaining the autonomous, isolated teacher. ("Open" space as we have known it would not be recommended as a design feature for houses.)

•Student learning resources - varied, tailored to students' modes of learning and keyed to appropriate levels of students' intellectual development.

•Students' learning plans directing their daily schedule of activities. (With teacher-scheduled experiences balanced by student-determined selections.)

•Community-based learning for students widely applied. (Particularly for secondary school students.)

•A student's performance over time evaluated primarily in terms of that individual's particular progress rather than by extrinsic, norm-referenced instrumentation. (The latter would be selectively applied as appropriate.)

•"Personalized computer scheduling" by students employed for most in-school task/space needs.

•Student learning teams organized for a variety of tasks emphasizing cooperative learning, problem-solving and communication skills.

•Students participating in the planning and evaluation of their own work thereby becoming more responsible.

A SET OF BELIEFS IN SUPPORT OF PERSONALIZED SCHOOLING

The following research-based statements are representative of human learning. Please indicate the extent of your agreement with these statements.

Statement	Disagree		Agree
Students learn at different rates and therefore may require varying amounts of time to complete a given task.	1	2	3
Students use different modes of learning, and therefore may require different learning materials, space or strategies in working toward the same learning goals and objectives.	1	2	3
Individual student needs best may be met in a learning group when the learning objective is clearly stated and when group composition, space, and time allocations are clearly related to the task demands.			
Students may require different kinds of assistance and motivation from the teacher.	1	2	3
Learning is an irregular yet continuous process which may be enhanced by basing student progress on achievement rather than age or time served.	1	2	3
Therefore, the following organizational characteristics ought to be implemented:			
Multi-age gouping rather than age or grade separation	1	2	3
Flexible scheduling of learning time for those experiences that meet students' individual needs	1	2	3
Flexible student learning groups based upon specific task readiness or interest	1	2	3

Statement	Disagree		Agree
Learning spaces tailored to accommodate specific tasks and diverse learning styles.	1	2	3
Interdisciplinary learning.	1	2	3
Staff organized in collegial teams for effective planning, different instructional roles, program evaluation, and personal and professional growth.	1	2	3
Concern for the affective as well as cognitive psychomotor needs of the student.	1	2	3
A humane climate with high morale and motivation for continued, cooperative improvement of the learning environment.	1	2	3
Increased opportunities for students to learn in the community setting or wherever appropriate to the accomplishment of the learning objectives.	1	2	3

THE ESSENTIALS OF EDUCATION: A CALL FOR DIALOG AND ACTION

Society Must Reaffirm the Value of a Balanced Education

Leaders of several professional organizations reached this conclusion in 1978. They circulated a statement on the essentials of education among a number of professional associations whose governing boards endorsed the statement and urged that it be called to the immediate attention of the entire education community, of policy makers and of the public at large.

The statement that follows embodies the collective concern of the endorsing associations. It expresses their call for renewed commitment to a more complete and more fulfilling education for all.

The associations invite the support and participation of everyone interested in education.

The Essentials of Education

Public concern about basic knowledge and the basic skills in education is valid. Society should continually seek out, define, and then provide for every person those elements of education that are essential to a productive and meaningful life.

The basic elements of knowledge and skill are only a part of the essentials of education. In an era dominated by cries for going "back to the basics," for "minimal competencies," and for "survival skills," society should reject simplistic solutions and declare a commitment to the essentials of education.

A definition of the essentials of education should avoid three easy tendencies: to limit the essentials to "the three R's" in a society that is highly technological and complex; to define the essentials by what is tested at a time when tests are severely limited in what they can measure; and to reduce the essentials to a few "skills" when it is obvious that people use a

severely limited in what they can measure; and to reduce the essentials to a few "skills" when it is obvious that people use a combination of skills, knowledge, and feelings to come to terms with their world. By rejecting these simplistic tendencies, educators will avoid concentration on training in a few skills at the expense of preparing students for the changing world in which they must live.

Educators should resist pressures to concentrate solely upon easy-to-teach, easy-to-test bits of knowledge, and must go beyond short-term objectives of training for jobs or producing objectives of training for jobs or producing citizens who can perform routine tasks but cannot apply their knowledge or skills, cannot reason about their society, and cannot make informed judgements.

What are the essentials of education?

Educators agree that the overarching goal of education is to develop informed, thinking citizens capable of participating in both domestic and world affairs. The development of such citizens depends not only upon education for citizenship, but also upon other essentials of education shared by all subjects.

The interdependence of skills and content is the central concept of the essentials of education. Skills and abilities do not grow in isolation from content. In all subjects, students develop skills in using language and other symbol systems; they develop the ability to reason; they undergo experiences that lead to emotional and social maturity. Students master these skills and abilities through observing, listening, reading, talking, and writing about science, mathematics, history and the social sciences, the arts and other aspects of our intellectual, social and cultural heritage. As they learn about their world and its heritage, they necessarily deepen their skills in language and reasoning and acquire the basis for emotional, aesthetic and social growth. They also become aware of the world around them and develop an understanding and appreciation of the interdependence of the many facets of that world.

More specifically, **the essentials of education include,** among others,

- •the ability to use language,
- •to think,
- •to communicate effectively,
- •to use mathematical knowledge and methods to solve problems;
- •to reason logically;
- •to fuse abstrations and symbols with power and ease;
- •to apply and to understand scientific knowledge and methods;
- •to make use of technology and to understand its limitations;
- •to express oneself through the arts and to understand the artistic expressions of others;
- •to understand other languages and cultures;
- •to understand spatial relationships,
- •to apply knowledge about health, nutrition, and physical activity;
- •to acquire the capacity to meet unexpected challenges;
- •to make informed value judgments;
- •to recognize and to use one's full learning potential;
- •and to prepare to go on learning for a lifetime.

Such a definition calls for a realization that all disciplines must join together and acknowledge their interdependence. Determining the essentials of education is a continuing process, far more demanding and significant that listing isolated skills assumed to be basic. Putting the essentials of education into pratice requires instructional programs based on this new sense of interdependence.

Educators must join with many segments of society to specify the essentials of education more fully. Among these segments are legislators, school boards, parents, students, worker's organizations, businesses, publishers, and other groups and individuals with an interest in education. All must now participate in a coordinated effort on behalf of society to confront this task. Everyone has a stake in the essentials of education.

Organizations for the Essentials of Education

American Alliance for Health, Physical Education, Recreation and Dance
American Council on the Teaching of Foreign Languages
American Theater Association
Association for Educational Communications and Technology
Association for Supervision and Curriculum Development
Home Economics Education Association
International Reading Association
Music Educators National Conference
National Art Education Association
National Association of Elementary School Principals
National Association of Secondary School Prncipals
National Business Education Association
National Council for the Social Studies
National Council of Teachers of English
National Council of Teachers of Mathematics
National Education Association
National Science Teachers Association
Speech Commmunication Association